

We claim:

1. A process for preparing high-functionality polyisocyanates,  
 5 which comprises
  - (i) preparation of an addition product (A) which contains one  
 group which is reactive toward isocyanate and at least  
 two isocyanate groups by reacting
    - 10 (a) a diisocyanate or polyisocyanate I with
    - (b1) compounds having at least three groups which are reactive  
 toward isocyanate or
    - 15 (b2) compounds containing two groups which are reactive  
 toward isocyanate or mixtures of (b1) and (b2),
 where at least one of the components (a) or (b) has
    - 20 functional groups having differing reactivities toward the  
 functional groups of the other component and the reaction  
 ratio is selected so that the addition product (A) contains  
 an average of one group which is reactive toward isocyanate,
    - 25 (ii) if desired, intermolecular addition reaction of the  
 addition product (A) to form a polyaddition product (P)  
 containing an average of one group which is reactive  
 toward isocyanate and an average of more than two  
 isocyanate groups, and
    - 30 (iii) reaction of the addition product (A) and/or the  
 polyaddition product (P) with a diisocyanate or  
 polyisocyanate II.
- 35 2. A process as claimed in claim 1, wherein the diisocyanate or  
 polyisocyanate I is different from the diisocyanate or  
 polyisocyanate II.
3. A process as claimed in claim 1, wherein the diisocyanate or  
 40 polyisocyanate I used is tetramethylene diisocyanate,  
 tetramethylene diisocyanate trimer, hexamethylene  
 diisocyanate, hexamethylene diisocyanate trimer, dodecyl  
 diisocyanate, isophorone diisocyanate trimer,  
 4-isocyanatomethyloctamethylene 1,8-diisocyanate,  
 45 diphenylmethane 4,4'-diisocyanate or a mixture thereof.

4. A process as claimed in claim 1, wherein the diisocyanate or polyisocyanate I has isocyanate groups of differing reactivity and is selected from among tolylene 2,4-diisocyanate, tolylene 2,6-diisocyanate, diphenylmethane 2,4'-diisocyanate, phenylene 1,3- and 1,4-diisocyanate, naphthylene 1,5-diisocyanate, tolidine diisocyanate, triisocyanatotoluene, biphenyl diisocyanate, isophorone diisocyanate, 2-butyl-2-ethylpentamethylene diisocyanate, 2-isocyanatopropylcyclohexyl isocyanate, 3(4)-isocyanatomethyl-1-methylcyclohexyl isocyanate, 1,4-diisocyanato-4-methylpentane, 4-methylcyclohexane 1,3-diisocyanate, dicyclohexylmethane 2,4'-diisocyanate and mixtures thereof.
5. A process as claimed in claim 1, wherein the diisocyanate or polyisocyanate II is selected from among tolylene 2,4-diisocyanate, tolylene 2,6-diisocyanate, diphenylmethane 4,4'-diisocyanate, diphenylmethane 2,4'-diisocyanate, higher homologues of diphenylmethane diisocyanate, naphthylene 1,5-diisocyanate, tolidine diisocyanate, phenylene 1,3- and 1,4-diisocyanate, triisocyanatotoluene, biphenyl diisocyanate, tetramethylene diisocyanate, hexamethylene diisocyanate, dodecyl diisocyanate, lysine alkyl ester diisocyanate, where alkyl is C<sub>1</sub>-C<sub>10</sub>-alkyl, isophorone diisocyanate, 2-methylpentamethylene diisocyanate, 2,2,4- or 2,4,4-trimethylhexamethylene 1,6-diisocyanate, 1,3- and 1,4-diisocyanatocyclohexane, 3(4)-isocyanatomethyl-1-methyl-1-isocyanatocyclohexane, 2-butyl-2-ethylpentamethylene diisocyanate, 4-isocyanatomethyloctamethylene 1,8-diisocyanate, 2-isocyanatopropylcyclohexyl isocyanate, 2- or 4-methylcyclohexane 1,3-diisocyanate, dicyclohexylmethane 4,4'- and 2,4'-diisocyanate, 1,3- or 1,4-bis(isocyanatomethyl)cyclohexane, xylylene diisocyanate, tetramethylxylylene diisocyanate and oligoisocyanates or polyisocyanates prepared from the isocyanates listed by coupling by means of urethane, allophanate, urea, biuret, uretdione, amide, isocyanurate, carbodiimide, uretonimine, oxadiazinetriene or iminooxadiazinedione structures, or from among mixtures of the isocyanates mentioned.
6. A process as claimed in claim 1, wherein, in the reaction of the addition product (A) and/or the polyaddition product (P) with the diisocyanate or polyisocyanate II, the ratio of isocyanate groups of the diisocyanate or polyisocyanate II to the isocyanate-reactive groups of the addition product (A) and/or the polyaddition product (P) is selected so that at

least 10%, preferably at least 40%, of the NCO groups of the diisocyanate or polyisocyanate II are reacted.

7. A process as claimed in claim 1, wherein the  
 5 isocyanate-reactive groups of the components (b1) and/or (b2) are selected from among hydroxyl groups, mercapto groups, amino groups and mixtures thereof.
8. A process as claimed in claim 1, wherein the diisocyanate or  
 10 polyisocyanate I used is isophorone diisocyanate, isophorone diisocyanate trimer, tolylene 2,4-diisocyanate or diphenylmethane 2,4'-diisocyanate and the diisocyanate or polyisocyanate II used is hexamethylene diisocyanate, a hexamethylene diisocyanate oligomer mixture, diphenylmethane  
 15 4,4'-diisocyanate, diphenylmethane 2,4'-diisocyanate, a mixture of diphenylmethane diisocyanates and higher homologues of diphenylmethane diisocyanate (polymeric MDI) or a mixture of the isocyanates listed.
- 20 9. A process as claimed in claim 1, wherein the compounds (b1) having groups which are reactive toward isocyanate are glycerol, trimethylolmethane, trimethylolethane, trimethylolpropane, 1,2,4-butanetriol, tris(hydroxymethyl)aminomethane,  
 25 tris(hydroxyethyl)aminomethane, 2-amino-1,3-propanediol, 2-amino-2-methyl-1,3-propanediol, diethanolamine, dipropanolamine, diisopropanolamine, ethanolpropanolamine, bis(aminoethyl)amine, bis(aminopropyl)amine, tris(aminoethyl)amine, tris(aminopropyl)amine,  
 30 trisaminononane, pentaerythritol, bis(trimethylolpropane), trifunctional or tetrafunctional polyetherols or polyesterols and the compounds (b2) used are ethylene glycol, diethylene glycol, triethylene glycol, 1,2- and 1,3-propanediol, dipropylene glycol, tripropylene glycol, neopentyl glycol,  
 35 1,2-, 1,3- and 1,4-butanediol, 1,2-, 1,3- and 1,5-pentanediol, hexanediol, propane-1,2-dithiol, butane-1,2-dithiol, mercaptoethanol, mercaptopropanol, mercaptobutanol, ethylenediamine, tolylenediamine, isophoronediamine, cysteamine, ethanolamine, N-methylethanolamine,  
 40 propanolamine, isopropanolamine, 2-(butylamino)ethanol, 2-(cyclohexylamino)ethanol, 2-amino-1-butanol, 2-(2'-aminoethoxy)ethanol or higher alkoxylation products of ammonia, 4-hydroxypiperidine, 1-hydroxyethylpiperazine, aminopropanethiol or bifunctional polyetherols or  
 45 polyesterols.

10. A high-functionality polyisocyanate, which can be prepared as claimed in claim 1.
11. A high-functionality polyisocyanate which can be prepared as claimed in claim 1 and has both aliphatically bound and aromatically bound isocyanate groups.
12. The use of a polyisocyanate as claimed in claim 10 for producing paints and varnishes, coatings, adhesives, sealants, pourable elastomers and/or foams.
13. A polyaddition product obtainable using a high-functionality polyisocyanate as claimed in claim 10.

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